Aalto-yliopisto
Perustieteiden korkeakoulu

Comparison of COVID19 policies using a SIR-model

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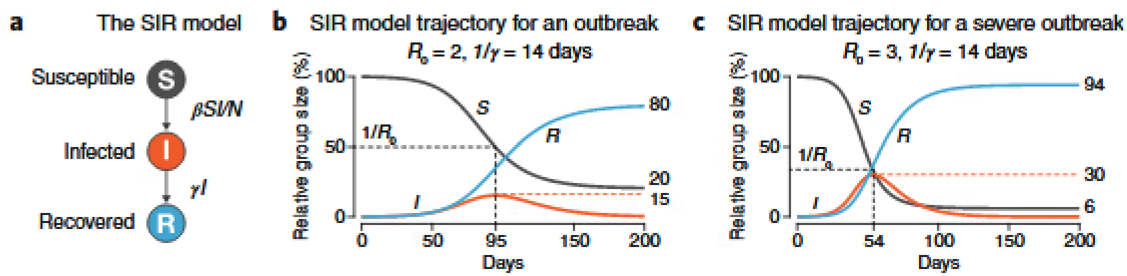
Modelling epidemics

- Mathematical models for predicting behaviour of infectious diseases [1]
  - SIR-models:

$$\frac{dS}{dt} = -\frac{\beta SI}{N}$$

$$\frac{dI}{dt} = \frac{\beta SI}{N} - \gamma I$$

$$\frac{dR}{dt} = \gamma I$$



where

- S,I,R represent the susceptible, infected and recovered/removed population
- $N = S + I + R$
- β is the rate of new infections and γ is the rate of recovery

SIR-models

- Different demographics of the whole population (countries, age/risk groups etc.) represented by considering a multivariate SIR-model [2],[3]
- Modification of SIR-models by introducing other conditions/variables such as productivity
  - Comparison of different spread reducing policies [2]
  - For example, lockdowns represented with a drop in productivity [2]

Objectives

- Development of a SIR-model
- Estimation of parameters based on real world data
- Simulation of a few scenarios
- Analysis of results
  - Are the results comparable to real world data?
  - Comparison of different spread reducing policies
    - E.g., different types of lockdown/limitations - Which ones are better for the economy/society long term?
- Limitations & challenges
  - The model could be too simple to produce meaningful/realistic predictions
  - Increasing the number of variables may increase complexity without producing meaningful results

Tools

- Different SIR-models [2],[3]
  - Difference equations
  - Differential equations
- Matlab
  - Estimation of model parameters [4]
  - Simulation of scenarios [4]

Timetable

- 3/2021 topic introduction
- 1-3/2021 review the litterature
- 2-4/2021 model development including parameter estimation, simulations
- 3-5/2021 work on the thesis
- 5/2021 final version ready

References

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- [3] I. Cooper, A. Mondal & C. Antonopoulus: A SIR model assumption for the spread of COVID-19 in different communities 2020.

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